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**REMARKS**

Prior to the present amendment, claims 14-22 were pending in the present application. By the present amendment, independent claim 14 has been amended. Thus, claims 14-22 remain in the present application. Reconsideration and allowance of pending claims 14-22 in view of the above amendments and the following remarks are requested.

**A. Rejection of Claims 14 and 17-22 under 35 USC §112, second paragraph**

The Examiner has rejected claims 14 and 17-22 under 35 USC §112, second paragraph. Applicants have amended independent claim 14 and submits that the requirements of 35 USC §112, second paragraph, have been met.

**B. Rejection of Claims 14-21 under 35 USC §102(e)**

The Examiner has rejected claims 14-21 under 35 USC §102(e) as being anticipated by U.S. patent number 6,200,629 B1 to Shih-Wei Sun (hereinafter "Sun"). For the reasons discussed below, Applicants respectfully submit that the present invention, as defined by amended independent claim 14, is patentably distinguishable over Sun.

The present invention, as defined by amended independent claim 14, recites, among other things, forming an upper electrode of a lower capacitor over a lower interconnect metal layer, patterning the lower interconnect metal layer to form a lower

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electrode of the lower capacitor, depositing an upper interconnect metal layer over an interlayer dielectric layer, forming an upper electrode of an upper capacitor over the upper interconnect metal layer, and patterning the upper interconnect metal layer to form a lower electrode of the upper capacitor, “wherein said lower electrode of said lower capacitor is electrically connected to said upper electrode of said upper capacitor so as to couple said lower capacitor and said upper capacitor in a parallel configuration.” As disclosed in the present application, a layer of interconnect metal, which can comprise, for example, aluminum or copper, is formed over a first interlayer dielectric layer in a semiconductor die. As disclosed in the present application, in one embodiment of the invention, the layer of interconnect metal can be a second interconnect metal layer in the semiconductor die.

As disclosed in the present application, a layer of high-k dielectric material is formed over the layer of interconnect metal, a layer of metal, such as titanium nitride or tantalum nitride is formed over the layer of high-k dielectric material and patterned to form an upper electrode of a lower capacitor, and the layer of interconnect metal is patterned to form a lower electrode of the lower capacitor. As disclosed in the present application, a second interlayer dielectric layer is formed over the upper and lower electrodes of the lower capacitor and a second layer of interconnect metal, which can comprise, for example, aluminum or copper, is formed over second interlayer dielectric layer. In one embodiment, the layer of interconnect metal formed over the second interlayer dielectric layer can be a third interconnect metal layer in the semiconductor die.

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As disclosed in the present application, a second layer of high-k dielectric material is formed over the layer of interconnect metal that is formed over the second interlayer dielectric layer, another layer of metal is formed over the second layer of high-k dielectric material and patterned to form an upper electrode of an upper capacitor, and the layer of interconnect metal is patterned to form a lower electrode of the upper capacitor. As disclosed in the present application, the lower electrode of the lower capacitor is electrically connected to the upper electrode of the upper capacitor to form a composite MIM capacitor that includes two capacitors (i.e. the lower and upper capacitors) connected in a parallel configuration. As a result, the present invention achieves a composite MIM capacitor having a capacitance value that is advantageously increased by utilizing space amply available between interconnect metal layers, such as second and third interconnect metal layers, in the semiconductor die. As disclosed in the present application, the present invention further advantageously achieves a composite MIM capacitor having a capacitance value with reduced voltage dependence.

In contrast to the present invention as defined by amended independent claim 14, Sun does not teach, disclose, or suggest forming an upper electrode of a lower capacitor over a lower interconnect metal layer, patterning the lower interconnect metal layer to form a lower electrode of the lower capacitor, depositing an upper interconnect metal layer over an interlayer dielectric layer, forming an upper electrode of an upper capacitor over the upper interconnect metal layer, and patterning the upper interconnect metal layer to form a lower electrode of the upper capacitor, “wherein said lower electrode of said

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lower capacitor is electrically connected to said upper electrode of said upper capacitor so as to couple said lower capacitor and said upper capacitor in a parallel configuration.”

Sun specifically discloses a method of forming a metallic capacitor including successively forming metallic layer 306 and dielectric layer 308 over substrate 300, where metallic layer 306 can be titanium nitride. See, for example, column 3, lines 25-32 and Figure 3A of Sun.

In Sun, dielectric layer 308 is patterned to form capacitor dielectric layer 308a, metallic layer 310 is formed and patterned on capacitor dielectric layer 308a to form metallic layer 310b, and metallic layer 306 is patterned to form metallic layer 306b. See, for example, column 3, lines 39-49 and Figures 3C and 3D of Sun. In Sun, metallic layer 310b serves as an upper electrode of a capacitor and metallic layer 306b serves as a lower electrode of the capacitor. See, for example, Sun, column 3, lines 49-53. In Sun, the processes discussed above can be repeatedly performed to form a stack of multi-layer metallic capacitors. See, for example, Figure 4 and related text of Sun. Thus, in Sun, the lower electrode of the capacitor is formed by patterning metallic layer 306, which can be titanium nitride. Sun further states that metallic layer 306b is part of an electromigration layer. See, for example, Sun, column 3, lines 65-67, and column 4, line 1.

Thus, in Sun, metallic layer 306b (i.e. a lower electrode of a capacitor) is not patterned from a lower interconnect metal layer, as specified in amended independent claim 14. Furthermore, Sun fails to teach, disclose, or remotely suggest patterning a lower interconnect metal layer to form a lower electrode of a lower capacitor and

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patterning an upper interconnect metal layer to form a lower electrode of an upper capacitor, as specified in amended independent claim 14. Additionally, as discussed above, Sun discloses forming a stack of multi-layer metallic capacitors. However, Sun fails to teach, disclose, or remotely suggest a composite capacitor comprising a lower and an upper capacitor, where a lower electrode of the lower capacitor is electrically connected to an upper electrode of the upper capacitor so as to couple the lower capacitor and the upper capacitor in a parallel configuration, as specified in amended independent claim 14.

For the foregoing reasons, Applicants respectfully submit that the present invention, as defined by amended independent claim 14, is not taught, disclosed, or suggested by Sun. Thus, amended independent claim 14 is patentably distinguishable over Sun and, as such, claims 15-21 depending from amended independent claim 14 are, *a fortiori*, also patentably distinguishable over Sun for at least the reasons presented above and also for additional limitations contained in each dependent claim.

**C. Rejection of Claim 22 under 35 USC §103(a)**

The Examiner has rejected claim 22 under 35 USC §103(a) as being unpatentable over the combination of Sun and U.S. patent application publication number 2003/0150384 A1 to Baude et al. (hereinafter "Baude"). As discussed above, amended independent claim 14 is patentably distinguishable over Sun. Thus claim 22 depending from amended independent claim 14 is, *a fortiori*, also patentably distinguishable over

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Sun, or any combination of Sun with Baude, for at least the reasons presented above and also for additional limitation contained in the dependent claim.

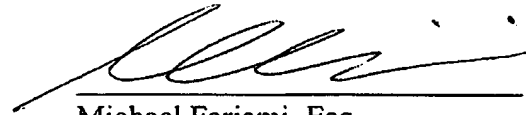
**D. Conclusion**

Based on the foregoing reasons, the present invention, as defined by amended independent claim 14 and claims depending therefrom, is patentably distinguishable over the art cited by the Examiner. Thus, claims 14-22 pending in the present application are patentably distinguishable over the art cited by the Examiner. As such, and for all the foregoing reasons, an early allowance of claims 14-22 pending in the present application is respectfully requested.

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Respectfully Submitted,  
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Date: 11/14/05



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